EnDuraLast

EDL-IGNS

Electronic Ignition System Installation Guide

Crank mounted hall sensor for use with the EDL4 line of alternators

EUROMOTOELECTRICS.COM

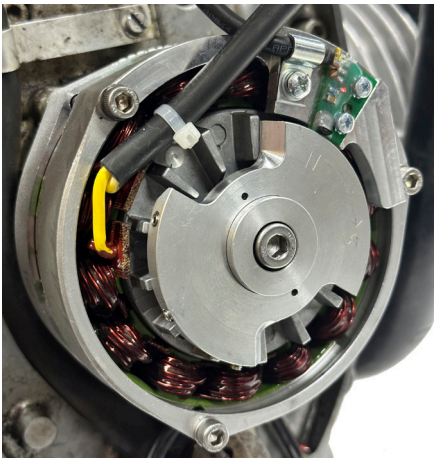
ELEKTRONIK SACHSE

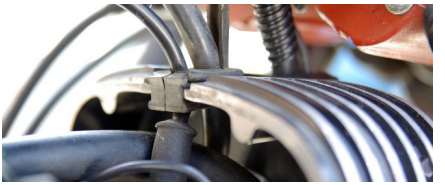
Made in Germany

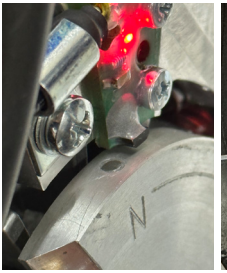
Quick Installation Steps

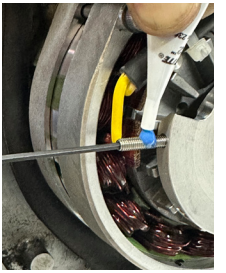
- Disconnect the battery and remove the front engine and starter covers
- Mount the trigger hub, trigger wheel, and pickup to the end of the alternator
- Route the pickup wire through the top of the engine
- Mount the ignition module with Velcro
- Wire the pickup and the included harness to the ignition module
- Wire ignition coil(s) per your specific installation
- Set ignition dip switches
- Reconnect the battery
- Set ignition timing;
  - Put engine at TDC
  - Ignition key ON
  - Rotate the trigger disk clockwise until the pickup led light just turns OFF
  - Tighten the trigger disk to the hub at this precise point. This is your static timing
- Start the bike and verify advance timing with a timing light
- Locktite trigger disk set screws once timing is perfect.
- Install the front engine cover and verify clearance between the front engine cover and the pickup and trigger.

The entirety of this installation guide details every installation scenario. Read through it in detail to ensure your installation is done properly









Introduction

These instructions cover the installation of the electronic ignition on BMW Airhead motorcycles model years 1970 through 1995. Working on 30+ year old motorcycles may require additional work to the wiring not specifically covered in these instructions.

Prepare the Bike

Verify that you have all the appropriate components, tools, and time to install this system correctly. Running the incorrect components can cause damage to the system, void the warranty, and add to frustration of an inoperable motorbike! Read through this installation guide completely to familiarize yourself with the process prior to starting. If you find additional components need to be purchased, pick them up before you begin the installation.

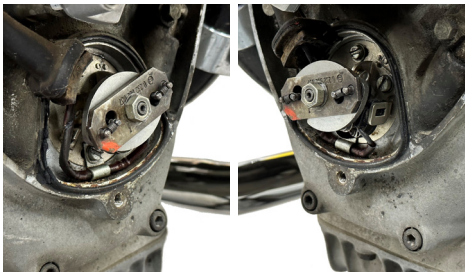
First thing is to disconnect the battery. Ideally you will put it on a charger so it is fully charged when the installation is complete. Place the bike on the center stand, flip open seat, and remove tool box. Turn off both fuel petcocks and disconnect the fuel lines. Remove the tank. Remove the front engine cover and the starter cover on top of the engine.

Identifying Your Existing Ignition System

Since many of these bikes have been modified over their life, it is important to identify what is installed, and how the bike was originally configured. There are four possible ignition configurations:

Contact Points Plate

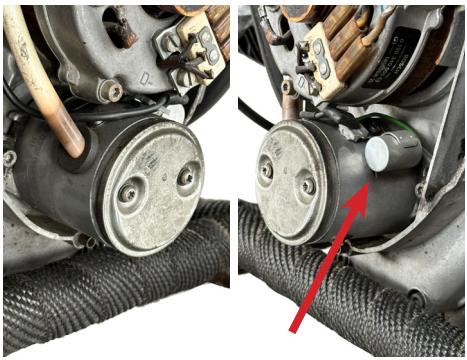
Airheads first came with contact points mounted on a plate that worked with a centrifugal advance mounted on the end of the camshaft and an ignition condenser mounted between the stator and diode board.



Contact Points in a Can

Then the points, ignition advance and condenser were installed in a round metal unit often called a "Bean Can" or "Points in a Can" because it is about the size of a can of beans.

You can identify Points in a Can by the small barrel shaped ignition condenser that is mounted on the side of it.

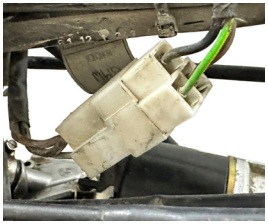


Transistorized Ignition

A hall effect sensor was installed inside the bean can to pick up piston position and ignition module used to trigger the spark. The coil was changed to a single, dual tower coil at this time.

On this system you will need to change the coil, remove the bean can, ignition module, and harness connecting them.

Take note where this harness connects to the main chassis harness. You will need to plug the new ignition module into this white plug with the included harness.



Aftermarket Ignition System(s)

If your engine has been upgraded to an older generation electronic ignition, usually Boyer or Dyna, remove it completely. They cannot be used with the EnDuraLast Electronic Ignition. Examples are shown below. Your new EnDuraLast ignition is superior to these older units in every way: more robust modern construction, better ignition curves, and crank-driven to avoid the vagaries of cam-driven timing.

Accel units were popular in the 1970s.

Boyer Micro Digital (Formerly MkIII)

Dyna DBR-1 points amplifier

Dyna III is a contact points replacement, using the original mechanical advance.

Bean Can Cover Plate (optional)

If you are removing a Bean Can on a 1981 - 1995 model, use Part # BMW-COVER to seal the engine. Remove the two M5 5mm Allen bolts, pull off the bean can and fit the cover plate. Secure the cover with the original two M5 bolts.

Compatible Components

The ignition system needs compatible components installed to provide long term reliability. A resistive component is only needed at one point in the ignition system. Meaning that between the spark plug and the plug wire cap, only ***ONE*** should have a resistor. Use a combination of:

5kΩ resistor cap with a NON resistor plug

OR

0Ω resistance cap and a resistor plug.

AND

3Ω coil configuration as seen by the ignition module.

These combinations are proven to work well. If you are unsure which components you have, inspect and test them!

Identify Your Spark Plugs

All spark plugs use the plug name to identify attributes about that plug, An "R" in the name identifies it as a RESISTOR plug. Common plugs are BOSCH and NGK.

Take note the BOSCH (left) is a resister version, it has the "R" in the name. The NGK (right) is a NON resistor, it does not have an "R" in the name.

How to OHM Spark Plug Wires

Most spark plug wire caps will have the resistance printed or engraved on them.

Alternatively you can measure the resistance manually. Using a digital multi-meter set it to the Ω setting, measure from spark plug nipple terminal to the coil end of the wire.

This includes the wire and the cap giving you the total resistance from end to end.

Compatible Ignition Coils

The Electronic ignition must use a coil congifuration between 2 - 4Ωs, Ideal is 3Ω. You can use stock BOSCH ignition coils used with points and condensers. When stock Airheads use two coils wired in series, each of these coils needs a primary resistance of 1.1Ω to 1.6Ω which provides 2.2Ω to 3.2Ω when wired in series.

Compatible Ignition Coils for Dual Spark Heads

The total resistance as seen by the ignition module needs to be maintained as a 2 - 4Ω coil configuration. When dual plugged Airheads use two coils wired in series, each of these coils needs a primary resistance of 1.1Ω to 1.8Ω providing 2.2Ω to 3.6Ω. The recommended coils on a dual spark modified Airhead are two 1.5Ω coils wired in series.

Incompatible Coils

The EME ignition is NOT Compatible with the stock electronic ignition coil found on the transistorized ignition system.

This dual tower coil has a primary resistance of around 0.7Ω.

How to OHM your Coil(s)

If you are unsure if your existing coil(s) are compatible or out of specification, testing them with a multi meter is an easy way to check. You can leave them installed on the bike, and disconnect all the wires connected to the coil, including the spark plug leads. With a digital multi-meter set to the Ω setting, measure as detailed below. Take note that if you are using two coils in series, the primary resistances are added together as presented to the ignition module. If any of these measurements are open circuit, short circuit, or too high resistance, the coil is bad or not compatible with this system.

Primary Resistance - Single Tower Coil

Measure between the positive and negative terminals. For a single tower coil wired in series, the primary resistance should be 1.2Ω ± 0.2Ω.

Secondary Resistance - Single Tower Coil

Measure between the spark plug wire terminal and either the positive or negative terminal. For a single tower coil wired in series, the secondary resistance should be 13kΩ ± 1kΩ.

Primary Resistance - Dual Tower Coil

Measure between the positive and negative terminals. For a dual tower coil the primary resistance should be 3Ω ± 0.4Ω.

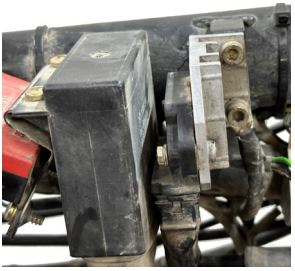
Secondary Resistance - Dual Tower Coil

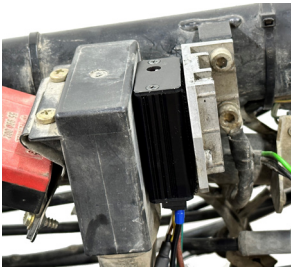
Measure between the two spark plug wire terminals. For a dual tower coil the secondary resistance should be 13.25kΩ ± 0.2Ω.

Mount The Ignition Module

Attach the ignition module with the included Velcro strip at any place out of the splash zone along the frame of the bike.

For early Airheads, it is recommended to change the large mechanical voltage regulator to a smaller, solid state option as shown to the right. The ideal location to secure the ignition module is on top of this smaller voltage regulator.





On later Airheads, the location of the previous ignition module is ideal for the new module as shown to the left.

Install Wheel Hub on Rotor Bolt

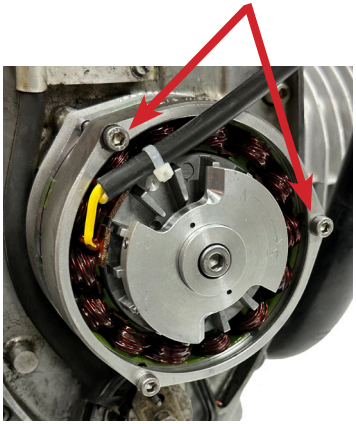
Remove the center bolt holding the EnDuraLast rotor to the crankshaft. Often this can be removed by “jerking” the wrench without holding the motor from turning. If the bolt won’t break loose, place the transmission in gear and apply the rear brake. This will keep the engine from turning.

Install the longer rotor bolt and lock washer provided through the wheel hub and back into the rotor and tighten with a torque wrench to 14 ft-lbs (168 inch-lbs). Do not over tighten!

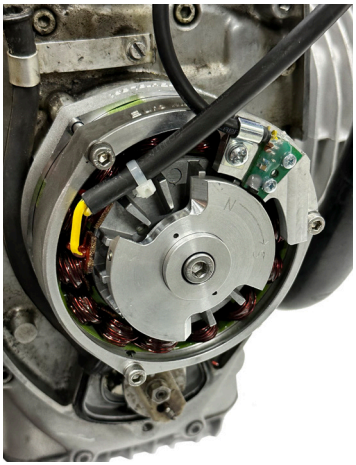
Position the timing wheel loosely on the on the hub with the “N” and “S” stamps facing outward so it can rotate independently. We will secure it later once you are setting the timing.

Install The Hall Sensor

Remove top two stator frame bolts holding the EnDuraLast stator to the timing case. Be careful not to bump or knock the stator once it is loosened.

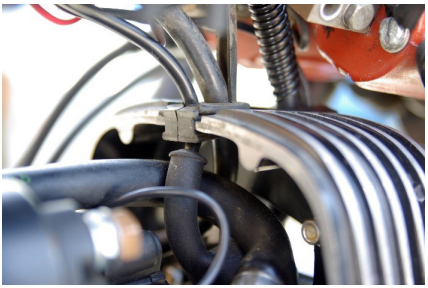


Depending on the orientation of the stator, slide the hall sensor bracket under the heavy black alternator cable onto the stator ring frame and re-insert bolts. Tighten stator housing bolts with a torque wrench and a 4 mm Allen bit to 3 ft-lbs (36 inch-lbs). *Do not over tighten! These are steel bolts going into an aluminum timing cover which can strip easily.*



Route Trigger Harness

The ignition module wire can be routed through the top of the engine through the original grommet of the timing chain cover. The front grommet is a much tighter fit and runs the risk of pinching the ignition module wire harness. The back grommet allows much more room for the ignition module lead. Some material must be removed from the grommet to allow room for the ignition pickup wire. Take care to not pinch the pickup wire or it may cause the system to be unreliable. (The rubber grommet is already molded for a second wire on 1980 and later models)



Should the grommet need replacing, both styles are available from EME.

DO NOT shorten the pickup wire! It is a shielded wire to prevent magnetic interference from the alternator. Coil any surplus wire and cable tie it securely.

Wire The Ignition Module

Two pre-made harnesses have been provided to make installation a snap! Only one will be used depending on the original ignition configuration. Early models with contact points will use the harness below:

Bike models with a bean can and ignition module used a sub-harness to connect them to the main chassis harness. This harness is removed and replaced using the harness with the white plug below:

The standard EDL-310 module is programed with 3 advance curves.

The optional EDL-312 module is programed with 9 advance curves, physically larger, has more robust internal electronics, and an additional tach signal output.

Wire the ignition module as shown below. Note the orientation of the plug and the terminals in the correct order. If wired in reverse order, power will be supplied in the wrong port and instantly destroy the module.

EDL-310 Module

6 1

1. **Ignition Coil Trigger BLACK**
2. **Ground BROWN**
3. **Pickup Ground BROWN**
4. **Pickup Signal YELLOW**
5. **Pickup Power WHITE**
6. **KEY ON voltage GREEN**

7 1

EDL-312 Module

1. **Ignition Coil Trigger BLACK**
2. **Ground BROWN**
3. **Pickup Ground BROWN**
4. **Pickup Signal YELLOW**
5. **Pickup Power WHITE**
6. **Tach Signal** (*Optional for custom applications*)
7. **KEY ON voltage GREEN**

Coil Wiring on Pre 1986 Models using TWO BOSCH Coils

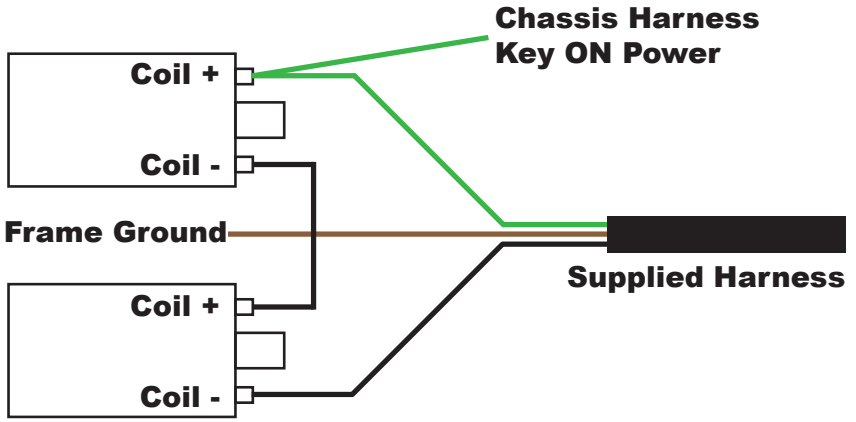
Pre 1986 models use two identical coils connected with a black jumper wire between the inside terminals (left coil negative, to the right coil positive). This is wiring them in series. Route the included harness from the ignition module to the coils.

Connect the Green wire to the left coil positive. There will already be a Green wire from the chassis harness here and an open spade terminal.

Connect the BROWN wire to the right mounting bracket front bolt. *(There will be other brown wires located on the left coil bracket, It is best to not stack too many grounds to one point).*

Exchange the original Black trigger wire that came from the original ignition with the new Black wire from the harness.

If the original contact points ignition was left in place, wrap a cable tie around the old black wire and the new black wire. If you need to change back to contact points, simply unplug the ignition module plug and exchange the black wires. *Models with electronic tachometers may have a second black wire connected here. Leave this connected to maintain the tach function.*



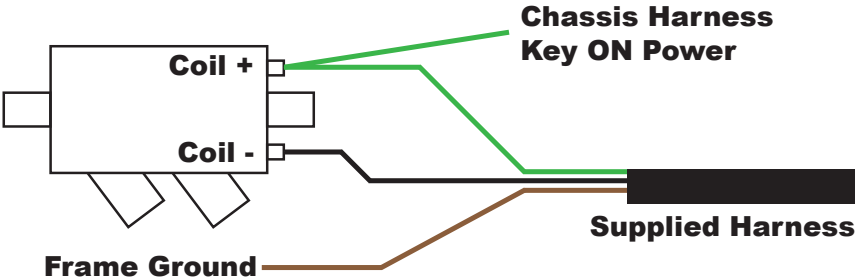
Coil Wiring Pre 1986 Models with Aftermarket Coil

If the bike has already, or if you are transitioning to, a single aftermarket dual tower coil (*EnDuraLast, Dyna*) the wiring is virtually the same! EnDuraLast and Dyna coils do not have polarity, meaning you will assign one terminal to be positive and the other negative. Use the included harness with ring and spade terminals.

Connect the two Green wires (From the chassis harness and the sub harness) to the assigned coil positive.

Connect the BROWN wire to the old coil mounting bolt. *(There will be other brown wires from the chassis harness to connect to the remaining old coil mounting bolt. It is best to not stack too many grounds at one point).*

Connect the Black wire to the remaining coil terminal. If the original contact points ignition was left in place, wrap a cable tie around the old black wire and the new black wire. If you need to change back to contact points, simply unplug the ignition module plug and exchange the black wires. *Models with electronic tachometers may have a second black wire connected here. Leave this connected to maintain the tach function.*



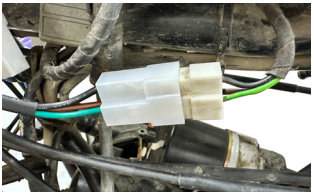
Coil Wiring on 1986 -1996 Models, Originally with a single BOSCH coil

Post 1986 models had a single Dual Output Bosch 0.6Ω coil which is **not compatible** with this ignition system. It must be replaced with a dual tower 3Ω coil as described earlier.

The EnDuraLast dual tower 3Ω coil with mounting bracket is ideal for these models. This coil (*and Dynatek coils*) do not have specified polarity. Simply carry over all the wires to the new coil, keeping them grouped as originally separated on the positive and negative terminals.

Using the included harness with the white plug, connect it to the white plug on the main harness. This plug has three terminals, Green, Black, and Brown, and will maintain the coil and tach function. *On post 1990 models, it will also maintain the Kill Switch function as intended.*

The original ignition system can be removed (Coil, Module, Bean Can and harness connecting them)



You can leave the original Bean Can installed as a plug, however it is recommended you install a cover plate to seal the timing chain cover at the camshaft.

If you care to set up a secondary ignition system, you can purchase a used contact points Bean Can, mount it on the camshaft and set the bike to run on the contact points. To change ignition on this setup, unplug the new ignition module and change the black trigger wire at the coil to switch ignition systems. This backup ignition will not provide tach function but will keep the bike operational and only recommended in an emergency.

Dual Spark Modified Airheads

Many Airheads have had the cylinder heads modified to receive an additional spark plug, referred to as Dual Spark Modified. Wiring a dual spark modified airhead is dependent on the year of the original configuration.

Coil Wiring on Dual Spark Early Models

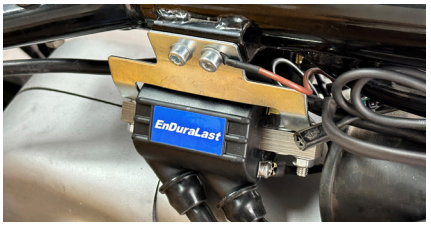
Early models with two BOSCH canister coils are the easiest to configure, as the bracket and dual tower coils offered occupy roughly the same space, and wiring is identical to the original configuration. The harness to use is the one included with spade and ring terminals.

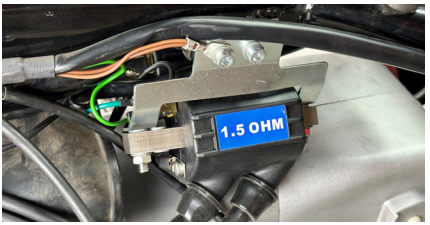
Wiring will mimic the original coil configuration. Make a jumper wire to run between the two coils inside terminals to connect them in series

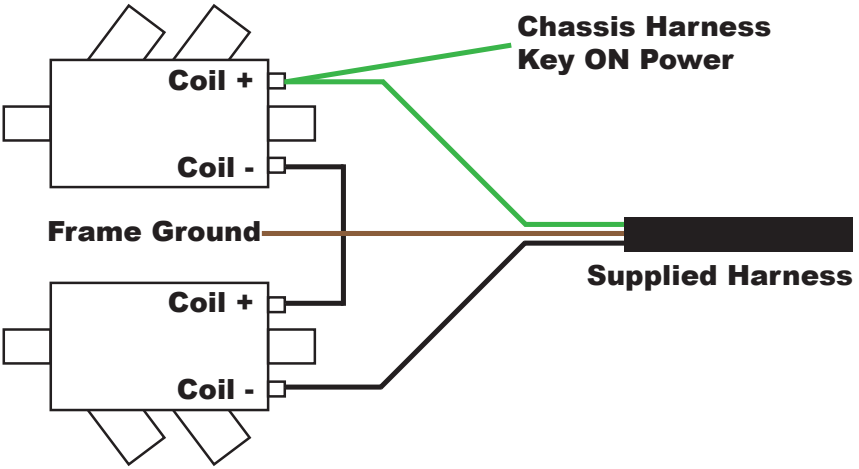
Connecting the two Green wires (From the chassis harness and the sub harness) to the left coil terminal assigned as positive.

Connect the BROWN wire to the right mounting bracket front bolt. *(There will be other brown wires located on the left coil bracket, It is best not to stack too many grounds to one point).*

Connect the Black wire to the remaining terminal on the right coil. If the original contact points ignition was left in place, put a cable tie around the old black wire to the new black wire. If you desire to change back to contact points, simply unplug the ignition module plug and change the black wire. *Models with electronic tachometers may have a second black wire connected here. Leave this connected to maintain the tach function.*







Coil Wiring on Dual Spark Late Models

Later models are a little harder to configure as positioning the two coils is problematic due to the limited alloted space. Regardless, the same wiring is configured with a pair of 1.5Ω dual tower coils that are wired in SERIES. To connect the new coils, extensions from the original coil connections need to be made, extending the Green to one coils assigned positive. Making a jumper wire from the first coil assigned negative to the second coils assigned positive, and extending the original black wire to the second coils assigned negative.

To maintain the coil and tach function, connect the white plug from the sub harness to the white plug on the main harness. The plug has three terminals, Green, Black, and Brown, and was identified when you removed the original ignition module harness.

Set Module Ignition Advance EDL-310

The Dip Switches are found on the rear of the module. Select the appropriate advance curve for your installation. Note the module is NOT preset.

- **Curve 1** has a quicker advance as RPM's increase and top at 34° advance. For **STOCK** single plugged heads.
- **Curve 2** has a quicker advance as RPM's increase and top at 28° advance. For modified **DUAL** plugged heads
- **Curve 3** has a slower advance as RPM's increase and top at 32° advance. Curve #3 is in the middle and may be ideal depending on the engine and total setup.

Dip switch positions

1	2	
Off	**Off**	**Module test mode**
On	**Off**	Advance Curve 1
Off	**On**	Advance Curve 2
On	**On**	Advance Curve 3

Set Module Ignition Advance EDL-312

DIP Switch's and the Rotary switch are located on the end of the ignition box. Dip Switch 1 is your over speed protection. Dip Switch 2 should be set up for your tach frequency requirement for either crankshaft or camshaft frequency. The Rotary switch is used to select the desired advance curve. Note the module is NOT preset. See advance curve illustration for greater detail on the advance curve options. Testing on a dyno is the ideal way to determine the optimal advance on a modified engine. Generally speaking, Curve 5 is good for stock engines and Curve 7 for dual spark modified engines.

Dip switches

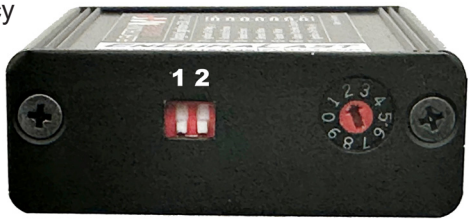
1 Over speed protection
- Switch down: 7900 rpm
- Switch up: 8700 rpm

2 Rev. counter output frequency
- Switch up: crankshaft
- Switch down: camshaft

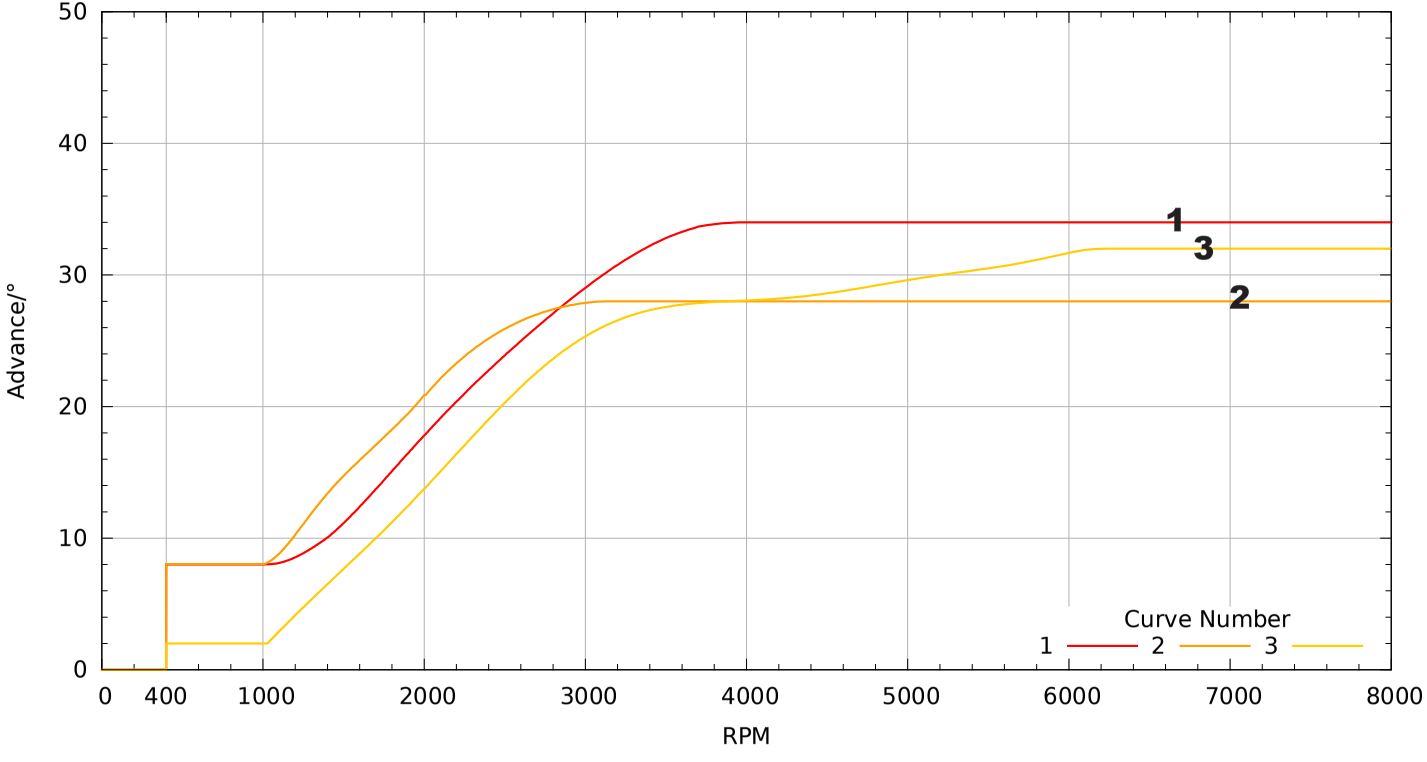
Rotary switch

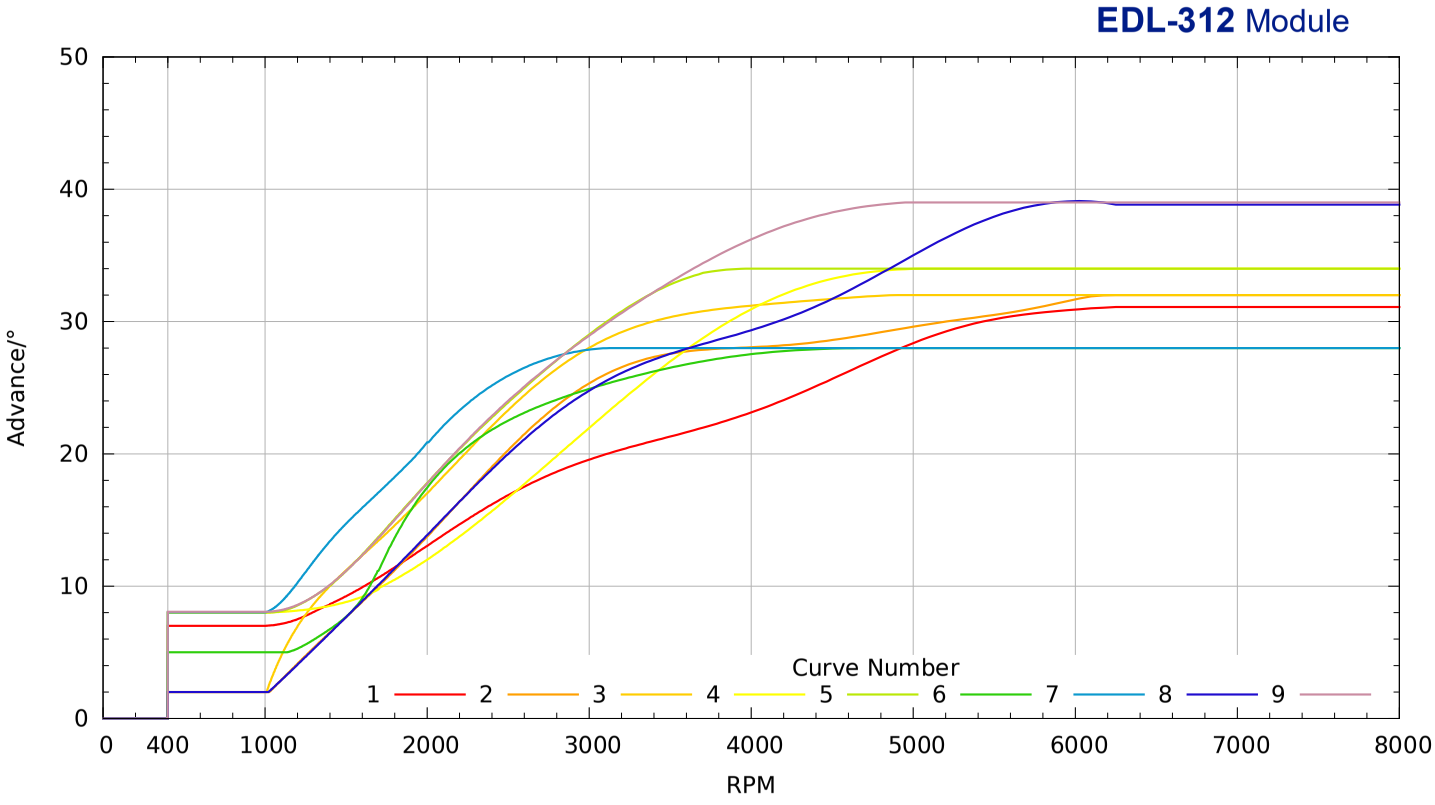
1-9 Advance curves 1-9

0 **Module test mode**



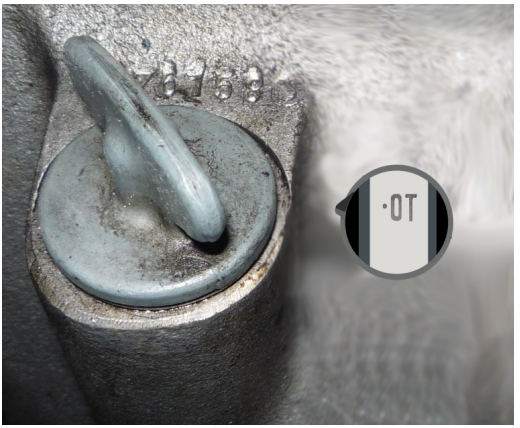
EDL-310 Module




EDL-312 Module
Advance/°
RPM
Curve Number
1
2
3
4
5
6
7
8
9
0
10
20
30
40
50
0
400
1000
2000
3000
4000
5000
6000
7000
8000

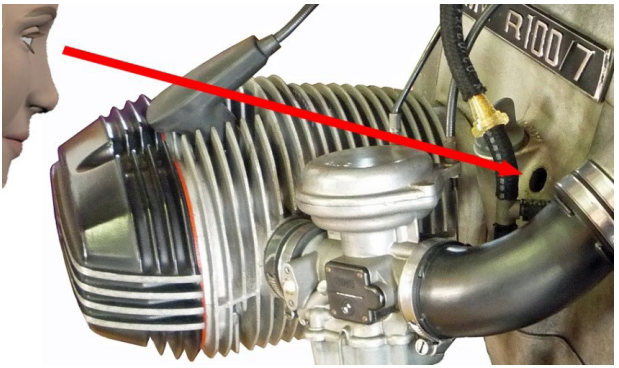
Turn The Crank to Top Dead Center (TDC)

Rotate the crankshaft so that the pistons are at top dead center (TDC), the highest point in their travel in the cylinders. Both cylinders on an Airhead have the same TDC crankshaft position.



The timing marks are stamped on the flywheel and viewed through the timing hole to the right of the dip stick.

There is a groove stamped into the left side of the timing hole. This groove is used to align timing marks, NOT the center of the hole.



Rotate the engine by putting the transmission into 2nd gear and bumping the rear wheel around. This is preferred over using an Allen wrench in the alternator rotor bolt to turn the crankshaft as this can wallow out the allen bolt hole. Turn the crank until the OT dot, to the left of the “OT” stamping on the flywheel, is exactly adjacent to the groove in the timing hole. (OT, in German, is Oberer Totpunkt, literally the “top dead point”.) In the event you are having trouble turning the engine over, the spark plugs can be removed but this isn’t usually necessary.

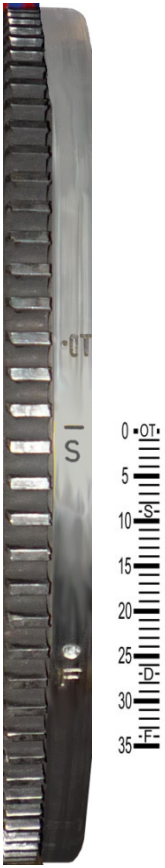
The apparent alignment of the flywheel timing marks with the groove on the engine can vary by several degrees by raising or lowering your head a few inches.

This is due to the viewing angle problem if your eyeball is not exactly perpendicular to the timing hole. The problem is worse on R65's which have a 20 mm smaller diameter flywheel that sits even farther from the timing window.

Airhead Timing Marks

1970 - 1990 BMW Airheads have three timing marks stamped on the flywheel:

- OT: Top Dead Center used for adjusting valves & Ignition timing.
- S: Static Ignition timing, Spaetzuendung, minimum or retarded advance. This is the timing mark to use when timing with the engine off or at idle.
- F: Fast ignition timing, Fruehzuendung (spark advanced), the maximum ignition advance. On later engines, the letter “F” was changed to a “Z”.



The horizontal line above the “S” and the dot above the “F” are the actual marks to use for timing. Some flywheels have two lines, one above and one below the timing letter. These indicate the permissible “range” of the timing, +/ 3° due to “split images”, i.e., the difference in timing between the right and left cylinders. Turning the engine over, peering into the timing window, the flywheel will appear to be moving down. From the perspective of a rider sitting on the motorcycle, the flywheel, crankshaft, rotor, camshaft and timing wheel all turn counter-clockwise.

When viewing the flywheel with a stroboscopic ignition light (timing light), the “S” horizontal line should appear at idle. As the RPM is increased, the “F” dot mark will slowly move up from the bottom into the window. It will stop moving up at about 2200 – 3800 RPM, depending upon model.

Rarely there may be a flywheel installed incorrectly on the crankshaft (being some multiple of 72° off) so all timing marks are in the wrong place. Re-install the flywheel correctly by installing the flywheel on the crank at TDC (pistons fully extended) with the “OT” mark in the timing window. Flywheels that have been lightened and/or balanced may also have had the timing marks machined off the flywheel. Put them back by measuring the distances from OT to the “S” and “F” marks from the chart on the next page.

The Circumference of all 1970-1980 Airhead flywheels is the same: 736.6 mm. So 1° of crankshaft rotation corresponds to 2 mm (2.046 mm actually) on the flywheel. The only exception to this is the R65 flywheel, which is 200 mm smaller in diameter. 1° of rotation of an R65 crank corresponds to 1.5 mm on the clutch carrier (flywheel).

Set the Static Timing

Reconnect the battery.

Set the engine at TDC.

Turn ignition key ON.

Rotate the timing wheel clockwise as viewed from the front of the engine. As the wheel rotates, the LED on the trigger plate will turn ON when the trigger magnet “S” stamped on the wheel passes the hall sensor. It will extinguish when the trigger magnet “N” on the wheel passes the hall sensor. Rotate the wheel a few revolutions to see how this works.

Slowly rotate the wheel until the LED just turns **OFF**.

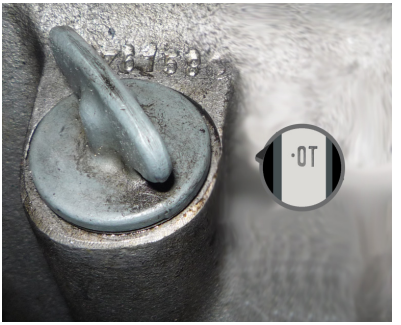
Lock the position with the three set screws keeping the magnets in line with the hall sensor.

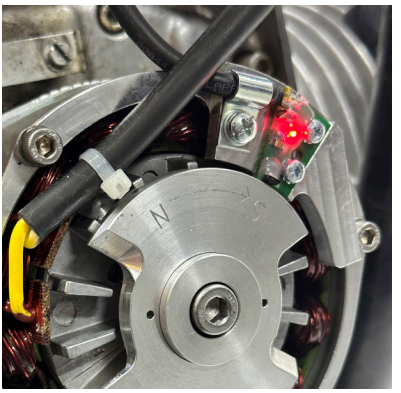
Start the engine and run to 3800RPM. Verify the advance timing with a timing light. Adjust the timing if needed by rotating the trigger disk appropriately.

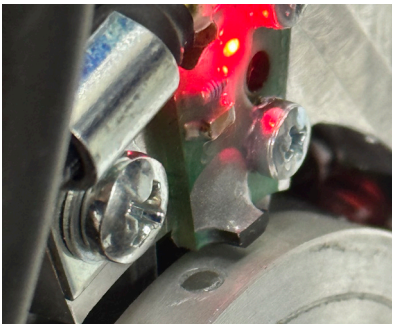
- Rotating the wheel to the ***RIGHT*** - Clockwise when viewed from the front - will ***ADVANCE*** the spark.
- Rotating the wheel to the ***LEFT*** -Counter Clockwise when viewed from the front - will ***RETARD*** the spark.

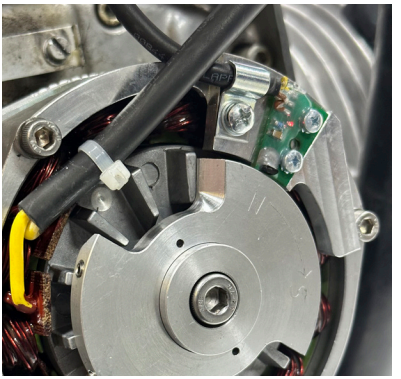
When you rotate the trigger wheel, the entire advance curve is moved up or down thus advancing or retarding the timing.

See the following pages for greater detail on ignition timing and the adjustments as they relate to BMW Airheads and the numerous variations and modifications that may be applicable to your specific installation.









Set Full Advance

The amount of ignition advance built into 1970-1980 BMW Airhead motorcycles was determined by the automatic advance unit or “ATU”. These varied during Airhead production as emission controls were introduced. The amount of advance built into the mechanical advance matched the timing marks stamped on the flywheel. For example, if an ATU had 25° degrees of advance, the distance on the flywheel between the “S” and “F” marks corresponded to 25° degrees of advance.

The 1970-1978 ATUs were primarily set up for power. The 1979-1980 canister models were retarded for emission control. While the EnDuraLast Electronic Ignition replaces the ATU, we will continue to use the “F” flywheel timing mark for identifying the fully advanced crankshaft position.

Models	Static BTDC	Advance Range	Total Advance	OT – F Distance2
Early /5	9° +/- 3°	30° +/- 2°	39° +/- 2°	79.8 mm
Late /5	9° +/- 3°	25° +/- 2°	34° +/- 2°	69.6 mm
Some /6, early /71	6° +/- 3°	25° +/- 2°	31° +/- 2°	63.4 mm
Some Late /6 and /7	6° +/- 3°	28° +/- 2°	34° +/- 2°	69.6 mm
1979 – 1980 (canister)	6° +/- 3°	26° +/- 2°	32° +/- 2°	65.5 mm
1981+ (electronic ign)	6° +/- 3°	26° +/- 2°	32° +/- 2°	65.5 mm

(1) After Jan 1, 1978, the static timing mark was retarded from 9° to 6° BTDC for better emission control. Most 1978 flywheels were mis-marked, 4 degrees retarded! A service bulletin describes how to time engine with marks at the top of viewing hole.

(2) For R65s, reduce the OT – F distances by 78%.

The above chart can be used to determine the total advance in degrees that the “F” mark on the flywheel corresponds to. It will be one of 31°, 32°, 34°, or 39°. When in doubt, especially for the ambiguous 1971 and 1978 model years, measure the distance between the “OT” dot and the “F” line. Then use the last chart column to identify the total advance represented by the “F” line.

Having determined what the stock flywheel “F” line ignition timing is, should it be used “as is”? Conventional wisdom might say to rotate the timing wheel so the “F” line is adjacent the timing groove in the timing window under a strobe timing light.

This may not be optimal. Early /5s probably had too much advance; the early /6s too little. The “sweet spot” for most single-plugged engines is about 34°. Ultimately testing on a Dyno by a trained technician to measure performance is the ideal method or setting the ignition timing.

Dual Spark Advance Timing

After a high compression Airhead has been dual-plugged the stock advanced ignition timing point must be retarded. There has been much dialog, testing, and controversy over what the ideal ignition advance curve should be. After 20 years of discussion, the Airhead community consensus is that dual-plugged engines should have idle timing near stock and fully advanced timing of 27° - 28° degrees. For a 28° advance curve, select advance curve 2 on the EDL-310 module.

Dynamically Checked Timing

Take note how the F “dot aligns with the groove on the window, not how it aligns in the window. Your groove may be stamped higher or lower in the window!

Attach a strobe timing light to the left coil spark plug wire. Start the engine and examine the timing marks on the flywheel through the timing window. Raise the RPM until the image stops advancing (moving up) the window, around 3800 (3000 on dual-plugged) RPM. Adjustments are made with the engine off.

To set the timing to the original maximum advance value, adjust (rotate) the timing wheel on the rotor so that at 3800 RPM and above the strobe image looks like as shown to the right:

To set the timing to 34° (whether or not this was the original BMW value), adjust the timing wheel on the rotor according to the flywheel type as below:

Single Plugged Ignition @ 34° Advance

31° F Mark Flywheel

32° F Mark Flywheel

34° F Mark Flywheel

39° F Mark Flywheel

Dual Plugged Ignition @ 28° Advance

31° F Mark Flywheel

32° F Mark Flywheel

34° F Mark Flywheel

39° F Mark Flywheel

Fine Tuning Ignition Timing

A particular engine's best ignition timing is dependent upon engine compression and fuel octane. The optimal ignition timing is also dependent on exhaust back pressure and if performance cam such as a "hot" 336 cam replaces a stock 308 camshaft.

These installation instructions use the best timing for the 1970-1990 Airheads. The 34° advance is conservative and will work with no pinging if the correct octane gasoline is used and the combustion chamber doesn't have higher than normal compression from carbonization. On 1981 and later Airhead models, with the lower 8.2 and 8.4 compression ratios, as well as the R50/5, should use 32° for the maximum advance.

The electronic ignition may, of course, be set to any advance value by simply rotating the timing wheel on the front of the engine. If you know what you are doing you won't need these instructions and the ignition advance can be set to any value. Too retarded timing under heavy load will result in higher exhaust valve and valve seat temperatures. Too advanced timing will result in engine pinging and possible engine damage. Pinging (also known as "detonation" and "knocking") sounds like steel balls being shook in a jar. It is very pronounced on an Airhead.

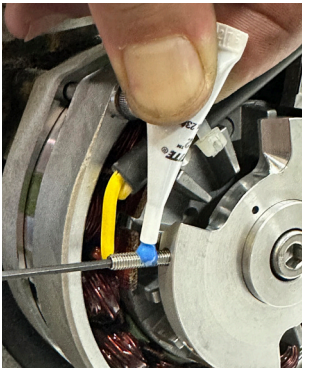
Significant deviation from the recommended 34° ignition timing value (28°for dual plugged) will eat up both performance and fuel economy.

To determine the absolute optional ignition timing for optimal horsepower on a specific engine, a dyno is needed. This may allow a couple of degrees advance beyond 34° to be used.

A shade tree alternative is to advance the timing until the engine just begins to ping and then backing off (retarding) 2 degrees. Pinging is best induced under an actual load going up a hill. Lug the engine in a high gear, at low RPM, with wide open throttle, with a warmed up engine, using the lowest octane fuel that will ever be used.

If ignition timing is advanced beyond what is recommended here to increase mileage and/or power with premium fuel, do not use lower octane fuels without returning to stock timing. The engine could be damaged by pinging for an extended period of operation.

Apply Thread Locking Compound



Now that you are comfortable that the timing is set to your satisfaction, remove each of the set screws **one at a time** on the trigger disk and apply a drop of the included Loctite thread-lock then re-install before going to the next set screw. Not securing the set screws with a thread locker can cause the set screw(s) to back out and contact the pickup, causing damage and system failure.

Install Front Cover

Due to the variance and changes through the many years of Airhead production, clearance between the timing wheel and front alternator cover must be checked. Damage can occur if the timing wheel is interfering with the front cover during engine operation.

Do **NOT** run the motorcycle with the front engine cover installed without first verifying clearance between the ignition trigger wheel and the front engine cover.

We recommend you apply a thin layer of grease to the high point of the trigger wheel, secure the cover completely then remove and inspect for any transfer of grease, identifying the point of contact. You may also use machinist putty if available.

In the rare case where you experience timing wheel interference with the front cover, the inside of the cover will need to be ground down to allow the space needed for the timing wheel to spin freely. Pay particular attention to the reinforcing ribs on the inside of the casting. This is a relatively thick casting, yet take care not take too much away in one go and not to grid all the way through the cover. Repeat until you can verify sufficient clearance.

Install Remaining Components

Lastly reinstall the starter cover, tank, battery positive terminal and any remaining items removed earlier to restore the bike to a safe working condition.

TROUBLESHOOTING GUIDE

Warning

Do not operate the engine with the spark plug caps disconnected from the spark plugs, not connected to anything (ungrounded), *or* connected to the spark plug but the spark plug not touching anything (ungrounded). This can damage the coils internally, fry the sensor, and damage the ignition module.

Battery Voltage

Battery voltage MUST be 12.5 Volts or higher. If your battery is over 3 years old, it may need to be replaced. If your battery has been discharged 3 times or more, it is sulfated and MUST be replaced! A load test is the best way to verify battery health.

Power To The Ignition System

Verify voltage to the module. The system needs a minimum of 5.9 volts to operate. The ignition pickup is powered from the ignition module.

Power to the Pickup

On the pickup circuit board there is an LED light that will illuminate in-line with the signal that is being sent to the ignition module. If this light is turning on and off with engine rotation the pickup is fine. If not verify that the trigger wheel is in-line with the pickup sensor

Check the Coils

Disconnect all the wires connected to the coils, including the high tension lead. With a multimeter on the ohms setting, measure the resistance between the two spade terminals on each coil. They should measure 2.0 - 3.5 Ω, this is the primary resistance of the coil. If outside this range, the coil is bad or you are using the wrong coils.

Instructions on how to measure coil resistance is detailed earlier in this installation guide.

Random Shutdown

If the system randomly shuts down after running perfectly, it is typically a resistance issue with the components used either being incorrect or out of specification. Loose connections or a faulty ground connection can cause the same symptom. On rare occasions it is heat related and, the pickup is suspect.

Check the Ignition Wires, Caps, and Plug Combination;

Option 1: 5kΩ caps with NON resistor plugs.

Measure the resistance end-to-end of the wire/spark plug cap combination. It should be approximately 5kΩ. A NON resistor spark plug must also be used. Check the part number on the plug, if there is an “R” then it is a resistor plug and not compatible. This system is known to work well with NGK BP6ES or the NGK equivalent in the appropriate heat range for your particular bike (BP5ES, BP7ES, etc.)

Option 2: 0kΩ caps with resistor plugs.

Measure the resistance end-to-end of the wire/spark plug cap combination. It should be approximately 0kΩ. A resistor spark plug must also be used. Check the part number on the spark plug, if there is an “R” then it is a resistor plug. This system is known to work well with NGK BPR6EIX or the NGK equivalent in the appropriate heat range for your particular bike.

Details on how to identify your spark plugs for resistor(s) and how to measure the resistance of your spark plug wires / caps are detailed earlier in this installation guide.

Check Timing Wheel

Remove the front engine cover exposing the trigger unit. Visually inspect it for contact with the front engine cover. Grasp the timing wheel to check if it is slipping on its hub. If so, the set screws have come loose. Follow the procedures for setting the electronic Ignition timing - when done, secure the wheel and use a thread locker on the grub screws.

Re-Install

Prior to reaching out to EME for support, we often find that an error was made in installation. Removing and reinstalling the system can often rectify an earlier error.

Pickup Test

With the front engine cover removed so you can view the pickup, turn over the engine with the starter. The LED on the trigger should turn on and off as the timing wheel passes.

- If the LED turns on and off correctly and there is still no spark, the issue is not the pickup.
- If the LED never turns off, loosen the set screws on the timing wheel and slide it in or out slightly on the hub to better align the Hall sensor with the magnets in the timing wheel. If the LED cannot be made to turn on and off then the trigger unit is defective.
- If the LED never comes on, check there is voltage supplied to the ignition module. It requires a minium of 5.9v to operate.

Ignition Module Self Test

A self diagnostic test can be run on the ignition module. To run a self test on the ignition module follow these steps:

1. Position the dip switches to test mode (**OFF|OFF or DOWN | DOWN** for the EDL-310 module, or for the EDL-312 module, point the **rotary switch to 0**.)
2. Pull one spark plug and reinsert into the plug wire cap. Ground the plug on the head so you can see the spark plug electrode.
3. Turn the ignition key **ON** - but **DO NOT START** the bike to supply power to the ignition system.
4. A faint rapid spark will be seen verifying they system is in good working order and has passed the self test.

If the spark plugs do indeed spark, the ignition module is not the issue, thus making the optical sensor suspect. If the spark plugs do not spark, the module is suspect after confirming the coils, plug wires, spark plugs are capible of creating a spark.

Replacement Components

Please note that all components are tested in Germany by the manufacturer prior to shipping. Incorrect installation, or using non-compatible components can cause the component failure.

Replacement components are available from the EME Website.

- Replacement Modules are **EDL-310 or EDL-312**
- Replacement Pickup is **EDL-IgnsPU**

IMPORTANT:

Use only compatible components with this system. Use a 3Ω coil configuration with:

- **NON Resistor spark plugs paired with 5kΩ plug wire caps.**

OR

- **Resistor spark plugs paired with 0kΩ plug wire caps.**

EnDuraLast

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